

What is claimed is:

1. A compact ion gauge for analyzing a sample gas, said compact ion gauge comprising:

a semiconductor substrate having a cavity therein with an inlet, a gas ionizing section adjacent said inlet, a ion gauge section adjacent said gas ionizing section, and a detector section adjacent said ion gauge section;

vacuum means evacuating said cavity and drawing said sample gas into said cavity through said inlet;

gas ionizing means in said gas ionization section of said cavity ionizing sample gas drawn into said cavity through said inlet to generate ionized sample gas; and

detector means detecting said ionized sample gas.

2. The compact ion gauge of claim 1 wherein said sample gas has multiple gas constituents, and wherein said detector means comprises means simultaneously detecting a plurality of said multiple gas constituents.

3. The compact ion gauge of claim 1 wherein said detector means comprises an array of detector elements.

4. The compact ion gauge of claim 3 wherein said detector elements are arranged in a linear array.

5. The compact ion gauge of claim 4 wherein said detector means further comprises electron collector chip connected with each detector element.

6. The compact ion gauge of claim 5 wherein said electron collector chip comprise v-shaped conductors formed on said semiconductor substrate in said detector section of said cavity, and wherein said detector elements include signal generators located outside or inside of said cavity.

7. The compact ion gauge of claim 6 wherein said semiconductor substrate is formed in two parts joined along parting surfaces extending through said cavity, and wherein said detector elements include signal generators located in recess means in said parting surface of one of said parts spaced from said cavity.

8. The compact ion gauge of claim 3 wherein said ion gauge comprises is micromachined.

9. The compact ion gauge of claim 8 wherein said field generating means includes opposed electrodes formed on said substrate in said cavity, and to which a voltage is applied to generate said electric field.

10. The compact ion gauge of claim 9 wherein said field generating means includes a magnet generating said magnetic field within said mass filter section of said cavity.

11. The compact ion gauge of claim 9 wherein said field generating means includes magnetic film formed on said substrate on opposed surfaces.

12. The compact ion gauge of claim 3 further comprises opposed primary electrodes on said substrate of said cavity to which a voltage is applied to generate said electric field.

13. The compact ion gauge of claim 12 further includes pairs of opposed trimming electrodes on said substrate of said cavity between said opposed primary electrodes to which trimming voltages are applied to make said electric field substantially uniform within said cavity.

14. The compact ion gauge of claim 3 wherein said gas ionizing means comprises a solid state electron emitter formed in said substrate in said gas ionizing section of said cavity.

15. The compact ion gauge of claim 1 wherein said gas ionizing means comprises a solid state electron emitter formed in said substrate in said gas ionizing section of said cavity.

16. The compact ion gauge of claim 15 wherein said gas ionizing means further includes ion optic means formed in said substrate in said gas ionizing section of said cavity.

17. The compact ion gauge of claim 1 wherein said vacuum means is connected to said chamber to provide differential pumping of said cavity.

18. The compact ion gauge of claim 17 wherein said gas ionizing means comprises a solid state electron emitter formed on said substrate in said gas ionizing section of said cavity and ion optics.

19. A solid state compact ion gauge for analyzing a sample gas with multiple gas constituents, said compact ion gauge comprising:

a semiconductor substrate having an elongated cavity therein with an inlet, a gas ionizing section adjacent said inlet, an ion gauge section adjacent said gas ionizing section, and a detector section adjacent said ion gauge section;

vacuum means differentially evacuating and drawing said sample gas into said cavity through said inlet;

gas ionizer means formed in said substrate in said gas ionizing section of said cavity and including a solid state electron emitter to which sample gas is drawn by said vacuum means and which generates ionized sample gas, and ion optic means comprising electrodes which collimate and accelerate said ionized sample gas; and

a detector in said detector section of said cavity arranged in said dispersion plane simultaneously detecting a plurality of said multiple gas constituents.

20. The compact ion gauge of claim 19 wherein said detector comprises a plurality of detector elements each comprising electrodes formed on said substrate and converging towards said dispersion plane, and detector cells formed in said semiconductor substrate removed from said cavity, and connected to said electrodes.